

SECTION 3 REFORMULATED ALTERNATIVES TO BE EVALUATED IN THE EIS

The following section describes the reformulated alternatives whose potential impacts will be evaluated in the EIS. The alternatives description is presented in the following sequence:

- Description of the No-Action Alternative indicating currently conducted practices for operation and maintenance of the RGCP;
- Description of three action alternatives: Modified O&M and Flood Control Improvement Alternative; Integrated USIBWC Land Management Alternative; and Targeted River Restoration Alternative;
- Description of other actions;
- Alternatives evaluated but eliminated from further consideration; and
- Implementation strategy.

3.1 NO ACTION ALTERNATIVE

The No Action Alternative consists of continuing O&M activities currently conducted at the RGCP by the USIBWC. Those activities are directed toward the objectives of flood protection and water delivery, with some activities involving environmental improvements.

Maintenance activities are accomplished to ensure that the flood control and water delivery objectives of the RGCP can be met. The two primary locations where O&M activities are carried out are El Paso, Texas and Las Cruces, New Mexico. The USIBWC regularly patrols the RGCP from these locations and conducts inspections prior to the flood and irrigation season of early March through September. Engineering surveys are performed regularly to identify potential problem areas due to sediment accumulation. The channel itself is inspected for bank sloughing, washing, or erosion during and after all flood events. Corrective actions are taken if problems are identified. Routine O&M practices currently conducted, described below, are summarized in Table 3-1.

3.1.1 Maintenance of the Levee System

Levees are inspected regularly at the beginning of each flood season and immediately after each flood event. Maintenance includes encouraging grass growth on the levee slopes for erosion control, cutting brush and tall weeds from the slopes, and repairing levee slopes. Levee slopes are mowed to prevent growth of brush and trees that could obstruct flows, or cause root damage to the structure itself.

Levee roadways are generally unpaved gravel roads designed for passage of O&M personnel and equipment. Levee maintenance includes road grading and road resurfacing with gravel as needed. The entire levee road system for RGCP is resurfaced within a 20-year cycle.

Table 3-1 Current O&M Practices (No Action Alternative)

Management Category	Practice
Levee System Management	Inspections and routine maintenance: erosion and vegetation control, and levee road maintenance (grading and resurfacing)
Floodway Management	Mowing of the floodway Grazing leases (3,552 acres within the ROW)
Pilot Channel and Irrigation Facilities Management	Channel maintenance: removal of debris and deposits, dredging, and channel protection by riprap placement Maintenance of drainage and irrigation structures Maintenance of American Diversion Dam
Sediment Management	Maintenance of five NRCS sediment control dams and associated access roads Sediment dredging from the mouth of the arroyos Sediment disposal

3.1.2 Floodway Management

Mowing of the Floodway

Floodway areas outside the main channel but between the flood control levees are maintained to remove obstructions. Mowing of the floodway controls weed, brush, and tree growth, and is conducted at least once each year prior to July 15. Farm tractors with rotary slope mowers are generally used to mow the floodways. Marden cutters are used for vegetation maintenance on the channel banks. Some areas with dense vegetation may require a second late summer mowing.

Since 1999 the USIBWC has conducted limited tree planting and maintained three provisional test areas (“no-mow” zones) intended to evaluate effects of additional vegetation growth on RGCP functions. Tree planting has been limited to approximately 800 non-irrigated cottonwood poles planted individually at 100-foot intervals. Due to drought conditions in recent years, only a fraction of the poles remain.

The first of the three no-mow zones extends 5 miles from Percha Dam to the Doña Ana County line and ranges in width from 10 to 35 feet. At an average 20-foot width, it covers approximately 24 acres. The second zone corresponds to Seldon Canyon where USIBWC historically has not conducted mowing operations as the agency’s jurisdiction is limited to the channel bed and stream banks. The third no-mow zone extends 5 miles from Shalem Bridge to Picacho Bridge, vegetation is allowed to grow for a width of 35 feet. Regular mowing is maintained in areas adjacent to bridges (400 feet upstream and downstream from the structure) and access points to the river (100-foot long segments located at 800-foot intervals). The extent of this no-mow zone is approximately 33 acres. In combination, no-mow zones outside Seldon Canyon cover less than 1 percent of the 8,332 acre RGCP floodway within the ROW.

Grazing Leases

The USIBWC administers a land lease program in the RGCP. Currently, 3,552 acres of a total of 8,332 acres of the RGCP floodway are leased. Additionally, no permanent structures may be constructed. By leasing land within the floodway, the need for mowing by the USIBWC is reduced. The floodway leases cover 2,384 acres in the Rincon Valley, and 1,030 acres in the Mesilla Valley (USIBWC 2000).

3.1.3 Maintenance of Pilot Channel and Irrigation Facilities

Channel Maintenance

Routine maintenance of the pilot channel is performed during non-irrigation periods when water levels are lowest. The RGCP main channel is maintained by removing debris and deposits, including sand bars, weeds, and brush that grow along the bed and banks. Any major depositions or channel closures caused by sediment loads from arroyo flows are removed. Channel excavation is performed with bulldozers or draglines either from the channel bank or from within the channel. Normal maintenance work on the main channel is conducted during the non-irrigation and flood seasons from September 15 to March 1. Islands and sandbars with vegetation may remain in place as long as the river's carrying capacity is not significantly affected. If required, annual maintenance includes placement of additional riprap to protect meandering channel and stream banks. Any scouring or gouging of the banks due to flooding is repaired immediately.

In the upper Rincon Valley artificial fish habitat structures were placed at 13 locations within the RGCP channel as a mitigation action required by the USACE Clean Water Act Section 404 permit for dredging sediments from the mouths of several arroyos. Three types of structures providing variable water velocity habitat for aquatic organisms were tested in the Upper Rincon Valley: vortex weirs (two structures), embayments (three structures), and rock groins (seven structures). These structures, built to test their performance as fish habitat, were monitored over a 3-year period. Most of those test structures are currently silted and no longer functional.

Maintenance of Irrigation Facilities

Drainage and irrigation structures in the RGCP are licensed to other entities by the USIBWC. The USIBWC Project Superintendent must confirm that the licensee adequately maintains the structures, and that all inlet and outlet channels to the structures are kept open and free of debris.

The Hatch and Rincon Siphons, operated and maintained by EBID, are subject to erosive forces that, if not controlled, would impact the integrity of the structures. The EBID protects the siphons by maintaining slow-moving backwater with riprap dams across the channel at the siphon crossings. Boulders are added periodically to reinforce the dams when excessive flows cause damage. The USIBWC has completed engineering evaluations for erosion protection of the two siphons and the Picacho flume (Montgomery Watson 2000, 2001).

Maintenance of American Diversion Dam

American Diversion Dam, defining the southern boundary of the RGCP, is operated by the USIBWC. The USIBWC Project Superintendent cooperates and coordinates dam operations with the USBR to ensure that water delivery objectives are met. Normal maintenance of the American Diversion Dam is performed during the non-irrigation season. Three other diversion dams associated with the RGCP (Percha Dam, Leasburg Dam and Mesilla Dam) are operated and maintained by EBID.

3.1.4 Sediment Management

Maintenance of NRCS Dams

Under an agreement with the EBID and Caballo NRCS District (IBM 65-356 dated December 10, 1965 and Supplement No. 1 dated February 15, 1974), the USIBWC is responsible for maintaining five NRCS sediment control dams and associated access roads. This maintenance includes mowing discharge canal slopes; cleaning and maintaining trash racks, intakes and outlets; repairing fences; and grading access roads. The USIBWC monitors the level of sediment in the dams to ensure that the outlet gates on the discharge structure are set to the proper level. This maintenance allows dams to perform effectively in reducing sediment load to the river and reducing flood potential. Public Law 93-126; Stat. 451, approved October 18, 1973, limits the USIBWC maintenance expenditures to \$50,000 per year. Maintenance work is generally done annually following joint inspections by the USIBWC, NRCS, and EBID personnel.

Sediment Removal from the Mouth of the Arroyos

The USIBWC conducts dredging at the mouth of the arroyos to maintain grade of the channel bed and ensure the channel conveys irrigation deliveries. This sediment removal is normally accomplished with tractor scrapers and draglines between September and March.

Sediment Disposal

Sediment collected from channel excavation, arroyo mouth maintenance, and other sediment control efforts is deposited on the floodway, on upland spoil areas, or on other federal or private lands approved for this purpose.

3.2 MODIFIED O&M AND FLOOD CONTROL IMPROVEMENT ALTERNATIVE

The primary focus of this alternative is to address known or potential flood control deficiencies in the RGCP. Actions incorporated into this alternative are intended to address the following issues:

- Adequacy of the levee system in terms of flood containment capacity (potential for peak water levels to reach the levees); and
- Improvement of erosion control in uplands and floodway to reduce sediment load to the RGCP and improve water quality.

Although the actions described below are primarily intended to improve RGCP functionality, they offer opportunities for environmental conditions improvement in the river and floodway. For instance, backwaters associated with erosion protection structures provide a valuable fish habitat, while sediment management practices could lead to reduced dredging.

3.2.1 Levee System Management

Current Practices

The Modified O&M and Flood Control Improvement Alternative retained the routine maintenance of the levee system in terms of inspections, erosion, and vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

In addition to routine levee maintenance, the alternative takes into consideration a potential increase in flood containment capacity. The flood containment capacity, as evaluated in 1996 by the USACE, identified a number of potential deficiencies in the RGCP on the basis of hydraulic modeling of the 100-year storm. Those findings were re-evaluated in 2001 as part of the development of the EIS to include potential effects of environmental measures such as vegetation growth in the floodway (Parsons 2001a).

Because evaluation of the 100-year flood levels is a risk management tool for extremely large floods of rare occurrence, analysis is based on conservative assumptions. There is also a potential to overestimate actual risk because the hydraulic model used in the simulation (HEC-2) estimates water levels assuming longitudinal attenuation of the flood peak along the RGCP (one-dimensional simulation), but it does not account for horizontal dissipation over the floodway (two-dimensional simulation). Flood control is discussed in Subsection 4.3.

The Modified O&M and Flood Control Improvement Alternative incorporates levee height increase and building of additional levees or floodwalls as the two measures to be considered in the EIS to increase flood containment capacity of the RGCP. These measures were adopted only as a work assumption to estimate impacts of potential construction activities because of the potential overestimation of levee deficiencies in terms of flood containment capacity, and incomplete information on the structural integrity of the levee system. Results of this evaluation are required to ascertain the need for a levee rehabilitation program, and to re-

assess the overall flood control strategy for the RGCP. Such strategy might incorporate addition of non-structural flood control measures such as flood easement acquisitions, limited levee setbacks to increase flood dissipation in the floodway, and/or removal of sediment within the flood plain that was deposited from dredging operations since project inception.

Table 3-2 presents current estimates of needed increase in flood containment capacity in the RGCP. The working assumption to quantify construction activities is that existing levees would be raised to meet freeboard design criteria or new levees would be constructed in unconfined areas where flood levels would extend past the ROW boundary. Construction of a floodwall in the Canutillo area to replace a discontinuous railroad berm was considered a priority action for flood control (USACE 1996). Modeling results were described in detail in the AFR (Parsons 2001a).

Table 3-2 Preliminary Estimates of Flood Control Improvement Program

Action	Miles by River Management Unit							
	Entire Project Area	Upper Rincon	Lower Rincon	Seldon Canyon	Upper Mesilla	Las Cruces	Lower Mesilla	El Paso
New levee or floodwall (6 ft. average height)	7.8	0.0	0.6	0.0	0.0	0.0	0.0	7.2
Rehabilitation (1-2 ft height increase)	64.3	0.0	7.4*	0.0	3.1	5.2	20.0*	28.6
Flood easement	5.4	3.4	0.0	1.3*	0.0	0.0	0.0	0.7

* Rehabilitation includes 5.8 miles in Lower Rincon and 1.3 miles in Lower Mesilla previously identified as levee setbacks (Parsons 2001a, Table 8.5). Easements in Seldon Canyon were previously identified as a new levee addition.

In areas where rebuilding of levees would be required, existing levee material would be re-engineered with clay material to meet specifications for the new levee. Additional material would be obtained from sediment removed from the active river channel as a result of maintaining channel capacity or from new borrow sites. Other sources of levee material would be from implementation of environmental measures such as lowering the bank in the form of successively low benches to promote establishment of cottonwood/willow seedlings, and reopening of old meanders.

3.2.2 Floodway Management

Mowing of the Floodway

No changes relative to the No-Action alternative.

Modified Grazing Practices

A management program would be developed and implemented in coordination with the NRCS to improve erosion control in areas within the ROW currently leased for grazing. Those areas include the floodway and uplands where the sloped terrain is more susceptible to erosion during storm events. The program would adopt additional best management practices (BMP)

according to conditions at each specific location. These BMPs would include physical methods such as placement of erosion control blankets in areas not yet vegetated, modified guidelines for livestock grazing leases, and monitoring to ensure vegetation is properly maintained.

Currently livestock grazing is allowed on 3,552 acres of RGCP land through leases (USIBWC 1994). Grazing can impact riparian areas leading to a higher weed cover, or trampling and creation of trails which are susceptible to erosion due to over-concentration of cattle (Kaufman and Krueger 1984; Krueper 1996). The USIBWC would implement additional BMPs for erosion control that might include 1) reducing mowing frequency and/or increasing mowing height to allow some vegetation recovery; 2) rotating mowing between grazing leases; 3) reducing frequency and extent of grading operations within the floodway; 4) mulching and seeding graded areas to minimize erosion; and 5) using erosion control fabric, silt fences, hay bales, and other measures to prevent erosion.

BMPs identified would be implemented within the framework of the USIBWC directive for management of grazing leases (USIBWC 2002). This directive assigns responsibilities for monitoring grazing leases, and requires lease renewals to be in compliance with USEPA's guidance for grazing in public lands (USEPA 1994), and Pollution Prevention/Environmental Impact Reduction Checklist for Grazing (<http://es.epa.gov/oeca/ofa/pollprev/graze.html>).

3.2.3 Maintenance of Pilot Channel and Irrigation Facilities

No changes relative to the No Action alternative.

3.2.4 Sediment Management

No changes relative to the No Action alternative in maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

3.2.5 Environmental Projects Associated with the Alternative

Six linear projects, listed in Table 3-3, were identified for the Modified O&M and Flood Control Improvement Alternative. Those projects entail modification of grazing practices to further reduce erosion in leased areas. Most of the leased areas are located in the Rincon Valley and upper Mesilla Valley (Table 3-3). No point projects apply to the alternative.

Table 3-3 Linear Projects Associated with the Modified O&M and Flood Control Improvement Alternative

ID	Measure		Upper Rincon	Lower Rincon	Upper Mesilla	Las Cruces	Lower Mesilla	El Paso	All RMUs
1	Grazing modification in uplands and floodway	Project: Acres:	UR-1 1911	LR-1 473	UM-1 638	LC-1 136	LM-1 256	EP-1 138	3,552

3.3 INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE

This alternative incorporates environmental measures within the floodway in combination with actions for flood control improvement, erosion protection, and reassessment of sediment management practices as previously identified for the Modified O&M and Flood Control Improvement Alternative. The Integrated USIBWC Land Management Alternative restricts all environmental measures to RGCP lands under USIBWC jurisdiction. Key features of this alternative are to:

- Develop a riparian corridor for bank stabilization and wildlife habitat using shavedowns of stream banks for overbank flows and plantings; and
- Promote development of native grasses in combination with salt cedar control to create “beads” surrounding and connecting riparian bosque.

3.3.1 Levee System Management

Current Practices

The alternative retains routine maintenance of the levee system in terms of levee erosion and vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

The alternative incorporates a re-evaluation of the RGCP flood containment capacity as previously described for the Modified O&M and Flood Control Improvement Alternative (Subsection 3.2.1). Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the alternative as a work assumption to estimate impacts of potential construction activities in the EIS.

3.3.2 Floodway Management

Two measures considered under the No Action Alternative are modified under the Integrated USIBWC Land Management Alternative, namely management of grazing leases and annual vegetation mowing. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP floodway as previously described in Subsection 3.2.2. For vegetation management, four measures described below are incorporated to partially replace mowing in various reaches of the RGCP:

- Modified management of grasslands;
- Planting of native vegetation;
- Enhancement of existing bosque; and
- Reconfiguration of stream banks for regeneration of native woody vegetation.

Modified Grassland Management in the Floodway

Currently both floodways and levee slopes in the RGCP are mowed at least once a year prior to July 15. The purpose of mowing is to control growth of shrubs and trees, especially

salt cedar. The modified grassland management would institute a modified mowing regime, native grass plantings, and a salt cedar control program. Areas subject to a modified grassland management measure would be expected to provide better wildlife habitat due to: 1) increase in structural diversity, 2) native herbaceous vegetation development, and 3) improved cover linking bosques and upland vegetation.

Native Vegetation Planting

In areas not subjected to recurrent overbank flows planting is the environmental measure used to establish native riparian vegetation. Restoration by planting may be accomplished through seeding, transplants, and pole planting. Depending on the planting method, establishment could require irrigation or micro-irrigation to increase probability of success (Dressen *et. al.* 1999).

Seeding: Seeds of native plants can be purchased from suppliers or collected from nearby areas and distributed in the floodway. Success of seedling establishment must be accompanied by clearing of competing vegetation, particularly invasive exotic species.

Transplants: Trees, shrubs, and herbaceous plants may be transplanted into riparian zones. A few well established individuals can help contribute seeds to the site as well as providing immediate wildlife benefits.

Pole planting: This technique involves obtaining long poles, or branches, from live trees and planting them in holes. Cottonwoods and willows are two species which can be successfully grown from poles. Researchers have increased pole planting success through such methods as 1) using very long poles inserted into holes drilled to the groundwater; 2) drilling holes to groundwater, backfilling with soil or mulch, and planting poles on top of the backfilled hole; 3) irrigating poles until their roots have reached groundwater; and 4) promoting root growth with rooting hormone compounds.

Bosque Enhancements

This measure involves selective removal of exotic vegetation in existing bosques to allow native vegetation establishment (Southwest Environmental Center 2002). Sites selected for bosque enhancement include wooded areas within the hydrologic flood plain. The process of selective removal would likely be extended to other restored areas as a long-term practice once riparian vegetation became established.

Reconfiguration of Stream Banks for Native Woody Vegetation Regeneration (Shavedowns)

This measure would allow overbank flooding within the floodway by lowering the stream bank ("shavedown") to within 1 foot of the irrigation flows to promote inundation during moderately-high storm flows. The process of shaving down would reconnect portions of the river and former flood plain. Overbank flooding within the floodway would provide conditions suitable for establishment and maintenance of native riparian species, particularly cottonwoods, whose seeds have a short period of viability and will only germinate in moist soil (Stromberg

and Patton 1991). Implementing this environmental measure would sufficiently lower the floodway at selected locations and allow for potential inundation during the months of March and April.

Table 3-4 indicates recurrence of peak daily flows during the months of March and April when establishment of cottonwoods and other native tree species typically occurs. Recurrence was estimated as the number of years from 1938 to 2001 when a given daily flow was exceeded, expressed on a percent basis. Peak flows were evaluated at 250 cfs increments from a typical irrigation season value of 1,500 cfs. The historical record shows a recurrence value of 54 percent for the 2,250 cfs flowrate indicating that approximately every 2 years the 2,250 cfs flowrate occurred for an average of 14 days during the months of March and April. All shavedowns were located within the hydrologic flood plain.

Table 3-4 Recurrence of Peak Daily Flows Below Caballo Dam from 1938 to 2001

Flow Below Caballo Dam	Number of Years When Peak Daily Flows Exceeded Listed Flows *	
	January to December	During March and April
1,500 cfs	63 (100%)	60 (95%)
1,700 cfs	63 (100%)	56 (89%)
2,000 cfs	61 (97%)	47 (75%)
2,250 cfs	52 (83%)	34 (54%)
2,500 cfs	38 (60%)	23 (37%)
2,750 cfs	26 (41%)	14 (22%)
3,000 cfs	13 (21%)	7 (11%)

* Daily flow data for Rio Grande below Caballo Dam, Station 08-3625.00
(http://www.ibwc.state.gov/wad/rio_grande.htm)

Cottonwood regeneration through overbank flows would require land preparation including disking, shavedowns, and partial excavation of areas which would be inundated at peak flow levels. Excavation would be performed in selected locations of the floodway to re-shape the bank, forming a series of low terraces subject to intermittent overflows and allow the establishment of vegetation adapted for those patterns. This measure is based on the partial stream restoration concept successfully implemented in the Middle Rio Grande at the Overbank Flow Project near Albuquerque, New Mexico, and the Bosque del Apache National Wildlife Reservation (Crawford et al. 1999).

3.3.3 Maintenance of Pilot Channel and Irrigation Facilities

No changes relative to the No Action alternative.

3.3.4 Sediment Management

No changes relative to the No Action Alternative in maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

3.3.5 Environmental Projects Associated with the Alternative

Both linear and point projects are associated with the Integrated USIBWC Land Management Alternative. Table 3-5 identifies the extent and location of environmental linear projects associated with changes in grazing leases and modified management of floodway vegetation.

Table 3-5 Linear Projects Associated with the Integrated USIBWC Land Management Alternative

ID	Measure		Upper Rincon	Lower Rincon	Upper Mesilla	Las Cruces	Lower Mesilla	El Paso	All RMUs
1	Grazing modification in uplands and floodway	Project: Acres:	UR-1 1911	LR-1 473	UM-1 638	LC-1 136	LM-1 256	EP-1 138	3,552
2	Modified grassland management in floodway	Project: Acres:	UR-2 639	LR-2 611	UM-2 22	LC-2 301	LM-2 68		1,641

Point projects for the Integrated USIBWC Land Management Alternative (Table 3-6) focused on the improvement and restoration of riparian vegetation. Projects are listed separately for vegetation planting within the hydrologic flood plain and for shavedown of stream banks to promote overbank flooding during moderately high storm flows. Point projects 105A and 104A, while listed under vegetation planting in Table 3-6, are predominantly enhancement of already existing bosques.

3.4 TARGETED RIVER RESTORATION ALTERNATIVE

Relative to the previous alternatives, the Targeted River Restoration Alternative emphasizes environmental measures associated with partial restoration of the RGCP, such as various methods for riparian corridor development, and opening of meanders and modification of arroyos to increase aquatic habitat diversification. Native vegetation establishment by overbank flows would be induced by controlled water releases from Caballo Dam during high storage conditions in Elephant Butte Reservoir. Environmental measures would also extend beyond the ROW through voluntary conservation easements to preserve wildlife habitat and encourage bosque development. This alternative also includes actions previously identified for flood control improvement.

Implementation of some of these measures, such as controlled water releases for riparian vegetation development and localized changes in channel geometry, are likely to require significant water acquisition. Key features of the Targeted River Restoration Alternative are:

- Develop a riparian corridor for bank stabilization and wildlife habitat;
- Increase opportunity of overbank flows using controlled water releases;
- Manage grasslands in combination with salt cedar control to “connect” riparian bosque locations in the floodway and river/upland ecotone;

**Table 3-6 Point Projects Associated with the Integrated USIBWC
Land Management Alternative**

Mile ID			Native Vegetation Planting	Bank Shavedowns for Riparian Vegetation
		Measure ID:	A	B
105	Oxbow Restoration	Project: Acres:	105A 6.6	
104	Tipton Arroyo	Project: Acres:	104A 2.5	104B 3.4
103	Trujillo Arroyo	Project: Acres:		103B 26.6
102	Montoya Arroyo	Project: Acres:	102A 2.8	102B 24.7
101	Holguin Arroyo	Project: Acres:	101A 6.0	101B 12.6
99	Green/Tierra Blanca	Project: Acres:	99A 5.1	
98	Sibley Point Bar	Project: Acres:		98B 4.1
95	Jaralosa South	Project: Acres:	95A 5.1	
94	Yeso Arroyo	Project: Acres:	94A 11.5	94B 3.9
92	Crow Canyon	Project: Acres:		92B 17.9
83	Remnant Bosque	Project: Acres:	83A 16.2	83B 17.9
78	Rincon/Reed Arroyo	Project: Acres:		
76	Bignell Arroyo	Project: Acres:	76A 10.3	76B 16.3
54	Channel cut	Project: Acres:	54A 19.6	
49	Spillway No 39	Project: Acres:	49A 15.9	
48	Spillway No 8	Project: Acres:	48A 34.6	
42	Clark Lateral	Project: Acres:	42A 15.4	
41	Picacho and NMGF	Project: Acres:	41A 71.3	
Total Acreage:			223	127

- Reopen low-elevation meanders, in addition to arroyo habitat, to provide backwater habitat and associated riparian vegetation; and
- Establish voluntary conservation easements outside the ROW to preserve remnant bosques and wetlands, create bosque and grassland habitat, and increase width of the river corridor.

3.4.1 Levee System Management

Current Practices

The alternative retains routine maintenance of the levee system in terms of levee erosion and vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

The alternative incorporates a re-evaluation of the RGCP flood containment capacity as previously described for the Modified O&M and Flood Control Improvement Alternative (Subsection 3.2.1). Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the alternative as a work assumption to estimate impacts of potential construction activities in the EIS.

3.4.2 Floodway Management

Management of grazing leases and annual vegetation mowing, as currently conducted under the No Action Alternative, are modified under the Targeted River Restoration Alternative. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP floodway as previously described in Subsection 3.2.2.

For vegetation management, development of a riparian corridor would be accomplished by the planting and enhancement of native woody vegetation, as well as modified grassland management, as previously described in Subsection 3.3.2. Under the Targeted River Restoration Alternative these measures would be complemented by use of seasonal peak flows to promote natural regeneration of riparian bosque, and use of conservation easements outside the ROW for connectivity with uplands. These two additional measures are described below.

Controlled Water Releases for Overbank Flooding

This measure would temporarily modify stream flows, allowing flood surges over the floodway to simulate historical overbank flows. Controlled releases from Caballo Dam up to a maximum flowrate of approximately 3,600 cfs above typical irrigation levels, would be scheduled to simulate spring/summer overbank flooding in the upper reaches of the RGCP. Rationale for selection of this target flow rate is presented in Appendix F. These discharges would be a combination of coordinated irrigation deliveries and additional water releases from the purchase of water rights, and would be limited to high water storage conditions in Elephant Butte Reservoir.

Due to a greater availability of potentially inundated floodway and proximity to the water release point (Caballo Dam), regeneration of native woody vegetation would take place largely in the Rincon Valley. Figure 3-1 presents an example of overbank flow limits within the ROW in low-elevation terrain of the north Rincon Valley. The extent of potential overbank flow by controlled releases from Caballo Dam is illustrated in Appendix F. A total of 516 acres have been identified as potentially inundated areas within the RGCP. The acreage by RMU is subsequently presented in the description of the alternatives' linear projects

Land preparation would include disking to remove vegetation, and partial shavedowns of stream banks. The ability to control the timing and intensity of flows has two primary advantages over shavedowns alone:

- Timed releases would ensure inundation during optimum cottonwood seed germination periods rather than by chance through storm events. This would ensure that bank preparation would not be in vain if a storm event did not occur; and
- Bank preparation (soil disturbance) in many locations could be conducted by disking rather than excavating since relatively higher water levels would be achieved through a controlled releases.

Voluntary Conservation Easements Outside ROW

This measure would incorporate lands outside the ROW for environmental improvements through conservation easements sponsored by federal agencies. Available programs include the National Parks Service Land and Conservation Fund, the USACE Continuing Authorities Program (Sections 206 and 1135 for ecosystem restoration), and NRCS programs for conservation reserves, wetlands reserves, wildlife habitat incentives, and environmental quality incentives. Areas identified for potential easements include remnant bosques and uplands, as well as some croplands. A total of 1,618 acres of potential conservation easements have been identified in areas adjacent to the RGCP. The acreage by RMU is subsequently presented in the description of the alternatives' linear projects.

The main function of easements would be to enhance the connectivity of riparian communities with upland areas, provide buffer zones, and increase corridor width. For existing bosques and undeveloped lands, the main purpose for easements would be to control their conversion to an alternate use. Management options for easements in agricultural lands include development of native grasslands in combination with salt cedar control, and reducing maintenance along sections of irrigation drains or canals to extend riparian vegetation and wetlands.

Along Seldon Canyon, where USIBWC has no land ownership, conservation easements were identified primarily in association with controlled water releases from Caballo Dam for overbank flows.

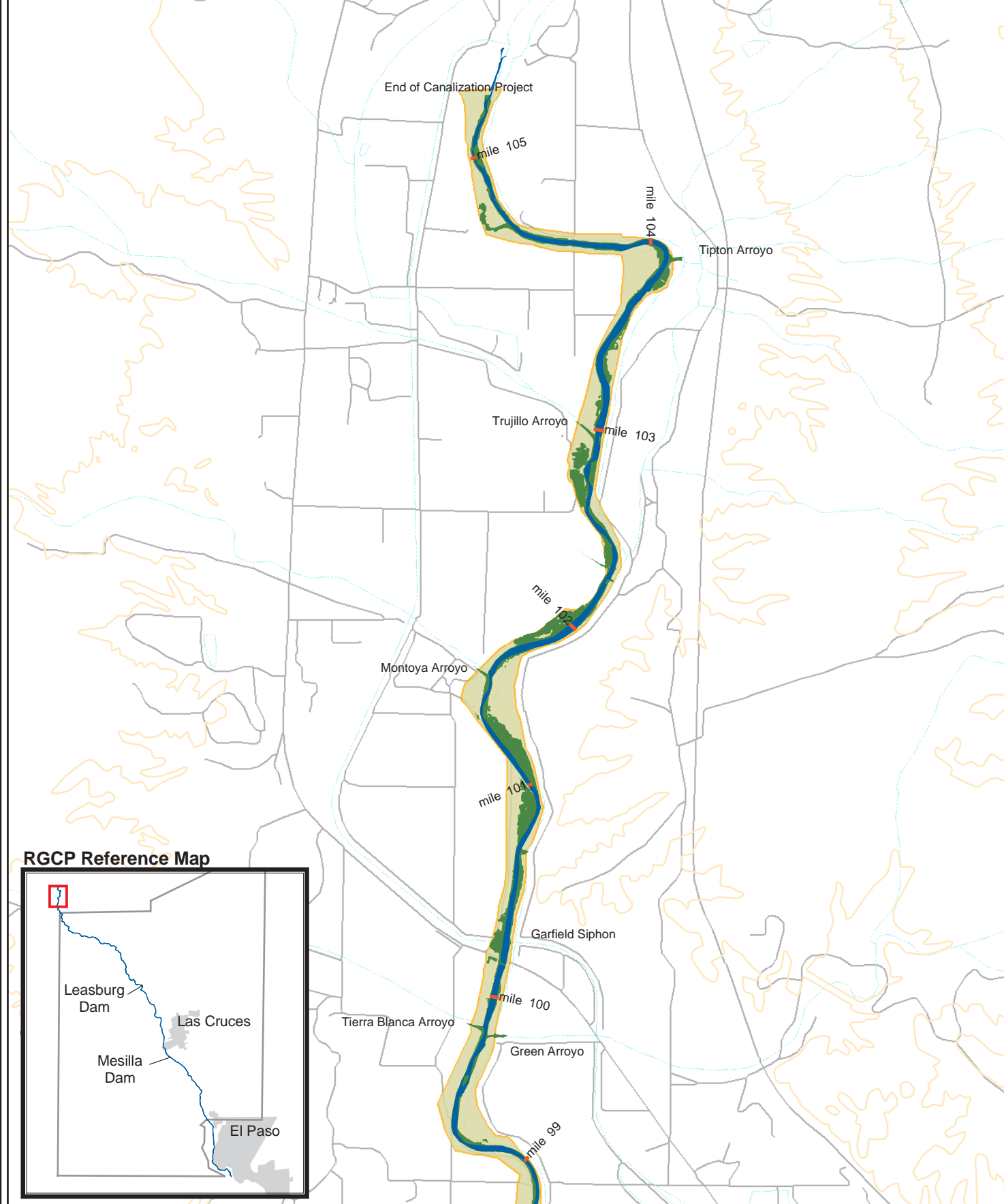



Figure 3-1

Overbank Flow in the Upper Rincon Valley by Controlled Releases from Caballo Dam

PARSONS




0 1,000 2,000 4,000
Feet

Irrigation Flow

5000 cfs Dishcharge

RGCP Right of Way



3.4.3 Maintenance of Pilot Channel and Irrigation Facilities

Current Practices

Under this alternative routine maintenance of the pilot channel is continued as indicated for the No Action Alternative in Subsection 3.1.4, as well as maintenance of American Diversion Dam and irrigation facilities. Partial changes in channel geometry are introduced in the Rincon Valley by reopening of former meanders within the ROW.

Reopening of Meanders Within the ROW

Re-establishment of five former meanders eliminated during construction of the RGCP (four in the Upper Rincon and one in the Upper Mesilla) would be conducted for diversification of aquatic habitat, to maintain hydraulic connectivity, and provide shelter for fish and invertebrates species. The reopened meanders would provide slow-moving waters during the late spring and early summer, a required condition for breeding and spawning of various native fish species. Such condition is uncommon in the RGCP because that period coincides with high flows of the main irrigation season (Subsection 4.4).

Reopening of meanders within the ROW would typically be done in the form of high-flow side channels. These structures would divert water during high flow periods, route it through a more shallow waterway with slower velocities, and return it downstream to the main channel. Backwater conditions would occur during low flow periods. Significant excavation within the ROW is required to develop the gradually sloping banks of the channel to provide aquatic and riparian habitat. Excavated meanders, with a combined surface area of 142 acres would be converted to a target of 25 percent open water and 75 percent native cottonwoods using shavedowns and/or plantings.

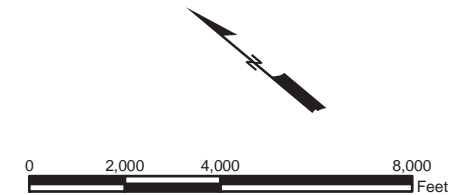
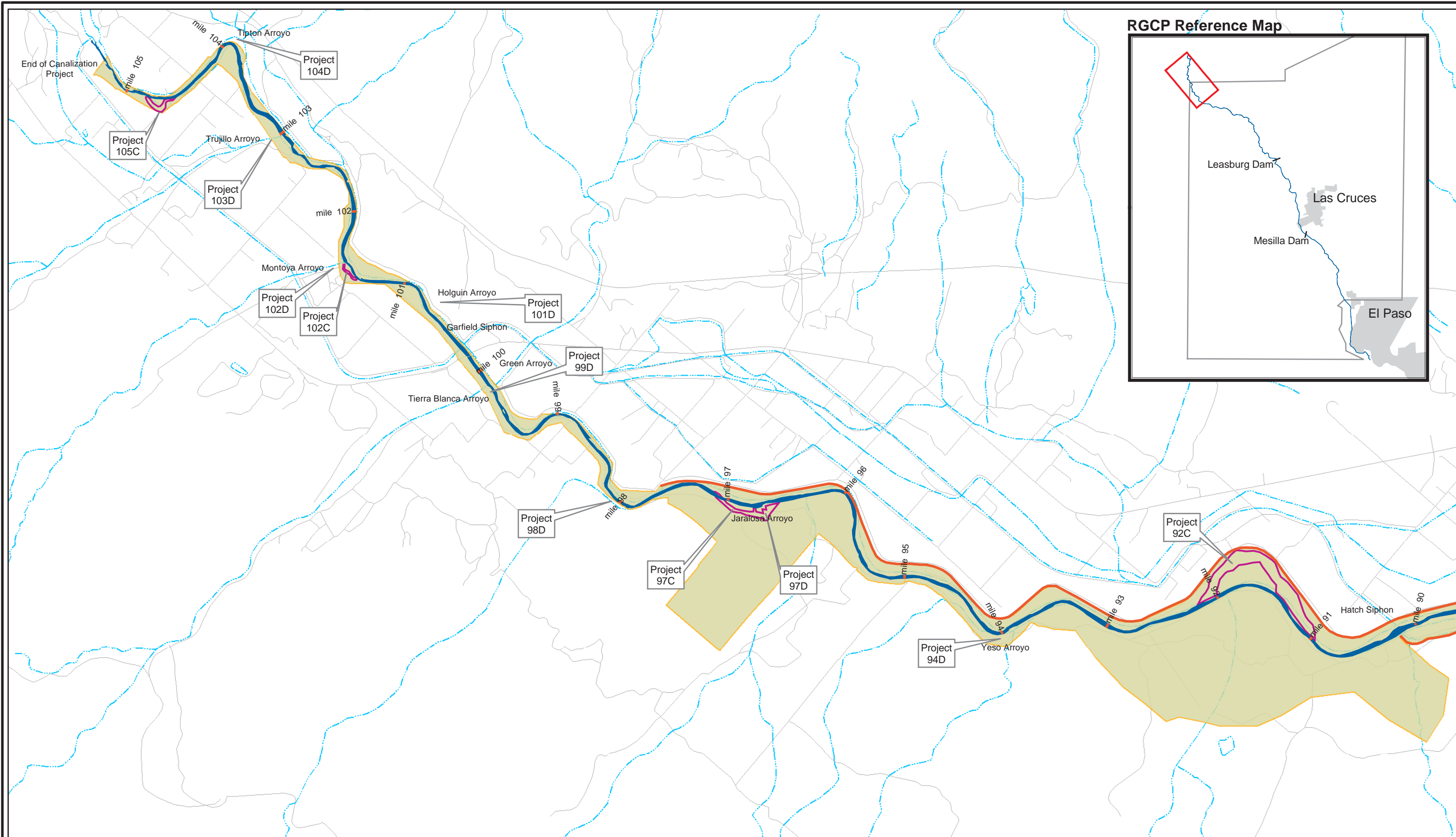
3.4.4 Sediment Management

Current Practices

Under this alternative maintaining five NRCS sediment control dams and associated access road would be conducted as indicated for the No Action Alternative while sediment disposal would be conducted primarily outside the ROW. Changes are also introduced for sediment removal from the mouth of the arroyos.

Arroyo Dredging for Habitat Diversification

Changes in sediment removal from the mouth of the arroyos are introduced in this alternative for diversification of fish habitat. This measure entails excavating the entrances of selected arroyos to increase the amount of backwater and bottom variation to increase the amount of slow-moving waters during the late spring and early summer. Twelve major arroyos in the Rincon Valley have been identified as having the most significant potential for diversification of aquatic habitat. Figure 3-2 illustrates habitat diversification in the Upper Rincon Valley.



- Irrigation Flow
- Right of Way
- Meander Reopening
- Levees

Figure 3-2

Aquatic Habitat Diversification
in the Upper Rincon Valley

PARSONS

3.4.5 Environmental Projects Associated with the Alternative

Both linear and point projects are associated with the Targeted River Restoration Alternative. Table 3-7 identifies the extent and location of linear projects associated with four types of environmental measures: modified grazing leases, modified management of grass lands in the floodway, seasonal peak flows, and voluntary conservation easements.

Table 3-7 Linear Projects Associated with the Targeted River Restoration Alternative

ID	Measure		Upper Rincon	Lower Rincon	Seldon Canyon	Upper Mesilla	Las Cruces	Lower Mesilla	El Paso	All RMUs
1	Grazing modification in uplands and floodway	Project: Acres:	UR-1 1911	LR-1 473		UM-1 638	LC-1 136	LM-1 256	EP-1 138	3,552
2	Modified grassland management in the floodway	Project: Acres:	UR-2 639	LR-2 611		UM-2 22	LC-2 301	LM-2 68		1,641
3	Seasonal peak flows to promote revegetation *	Project: Acres:	UR-3 214	LR-3 302						516
4	Voluntary conservation easements	Project: Acres:		LR-4 536	SC-4 * 808	UM-4 28		LM-4 202	EP-4 44	1,618

* Easements in Seldon Canyon are associated with induced seasonal peak flows.

Point projects for the Targeted River Restoration Alternative, summarized in Table 3-8, are focused on restoration of the riparian corridor and diversification of the aquatic habitat by reopening low-elevation meanders and modifying arroyo habitat.

Table 3-8 Point Projects Associated with the Targeted River Restoration Alternative

Mile ID			Native Vegetation Planting	Open Former Meanders	Modify Dredging at Arroyos
Measure ID:			A	C	D
105	Oxbow Restoration	Project: Acres:		105C 6.6	
104	Tipton Arroyo	Project: Acres:	104A 2.5		104D 0.15
103	Trujillo Arroyo	Project: Acres:			103D 0.71
102	Montoya Arroyo	Project: Acres:		102C 2.8	102D 0.17
101	Holguin Arroyo	Project: Acres:	101A 6.0		101D 0.16
99	Green/Tierra Blanca	Project: Acres:	99A 5.1		99D 0.27

Mile ID			Native Vegetation Planting	Open Former Meanders	Modify Dredging at Arroyos
	Measure ID:		A	C	D
98	Sibley Point Bar	Project: Acres:			98D 0.28
97	Jaralosa Arroyo	Project: Acres:		97C 28.0	97D 0.44
95	Jaralosa South	Project: Acres:		95C 5.1	
94	Yeso Arroyo	Project: Acres:	94A 11.5		94D 0.44
92	Crow Canyon	Project: Acres:		92C 84.6	
85	Placitas Arroyo	Project: Acres:			85D 0.52
83	Remnant Bosque	Project: Acres:	83A 16.2		83D 0.28
78	Rincon/Reed Arroyo	Project: Acres:			78D 2.74
76	Bignell Arroyo	Project: Acres:	76A 10.3		76D 0.66
54	Channel cut	Project: Acres:		54C 19.6	
49	Spillway No 39	Project: Acres:	49A 15.9		
48	Spillway No 8	Project: Acres:	48A 34.6		
42	Clark Lateral	Project: Acres:	42A 15.4		
41	Picacho and NMGF	Project: Acres:	41A 71.3		
Total Acreage:			189	147	7

3.5 SUMMARY OF ALTERNATIVES

Tables 3-9 and 3-10 present summaries of the reformulated alternatives. Table 3-9 presents a comparison of measures by management category between the No Action Alternative and the three action alternatives. Most changes are associated with management of the floodway under the Integrated USIBWC Land Management Alternative and the Targeted River Restoration Alternative. Changes in levee rehabilitation and sediment disposal apply to all actions alternatives. The Targeted River Restoration Alternative also includes changes in aquatic habitats (modified dredging of arroyos and reopening of meanders). Table 3-10 provides a project list by management category and environmental measure. The applicability of those projects to each of the action alternatives is also indicated.

Table 3-9 Summary of Alternatives by Measures

Management Category	No Action Alternative	Modified O&M and Flood Control Improvement Alternative	Integrated USIBWC Land Management Alternative	Targeted River Restoration Alternative
Levee System Management	Routine levee maintenance	No change	No change	No change
		Levee rehabilitation	Levee rehabilitation	Levee rehabilitation
Floodway Management	Continued annual mowing	No change	Reduced mowing (area, timing)	Reduced mowing (area, timing)
	Unmodified grazing leases	Modified leases (erosion control)	Modified leases (erosion control)	Modified leases (erosion control)
			Modified grassland management	Modified grassland management
			Native vegetation planting / bosque enhancement	Native vegetation planting / bosque enhancement
			Stream bank reconfiguration	Seasonal peak flows / bank preparation
				Conservation easements
Pilot Channel / Irrigation Facilities Management	Maintenance of American Dam and irrigation structures	No change	No change	No change
	Debris and deposit removal and channel protection	No change	No change	No change
				Reopening of former meanders within ROW
Sediment Management	Sediment control dam maintenance	No change	No change	No change
	Sediment removal from the mouth of the arroyos	No change	No change	Modified dredging in arroyos for aquatic habitat diversification
	Disposal mainly in the floodway	Disposal mainly outside ROW	Disposal mainly outside ROW	Disposal mainly outside ROW

Table 3-10 Summary of Alternatives by Projects

Management Category	Project List	ALTERNATIVE*			
		MFCI	IULM	TRR	
Floodway Management					
Modified grazing leases (erosion control)	UR-1, LR-1, UM-1, LC-1, LM-1, EP-1	X	X	X	
Modified grassland management	UR-2, LR-2, UM-2, LC-2, LM-2		X	X	
Vegetation planting and bosque enhancement	104A to 48A (14 Projects)		X	X	
Stream bank shavedowns	104B to 76B (9 Projects)		X		
Seasonal peak flows / bank preparation	UR-3, LR-3			X	
Conservation easements	LR-4, SC-4, UM-4, LM-4, EP-4			X	
Pilot Channel Management					
Reopening of former meanders	105C to 54C (6 Projects)			X	
Sediment Management					
Modified arroyo dredging for habitat	104D to 76D (12 Projects)			X	

* MFCI, Modified O&M and Flood Control Improvement Alternative; IULM, Integrated USIBWC Land Management Alternative; TRR, Targeted River Restoration Alternative.

3.6 OTHER ACTIONS

Complete environmental impact analysis of proposed or alternative actions must consider cumulative impact analysis due to other actions. A cumulative impact, as defined by the NEPA is the impact to the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Two actions have been identified as additional actions to the RGCP management: analysis of structural condition of the levees and recreation enhancement within the ROW.

3.6.1 Analysis of Structural Condition of the Levees

The need for levee rehabilitation due to structural deficiencies is not currently known. The extent of such rehabilitation would be dependent on findings of an ongoing investigation to verify levee condition. The three-step investigation entails aerial geophysical surveys, followed by surface geophysical surveys, and a geotechnical drilling program. The goal of aerial geophysical surveys is to identify the regions of levee that yield questionable electrical

conductivity values as related to soil composition. Resulting electrical conductivity values would then be correlated to known soil properties and characteristics, thus providing a regional representation of levee composition (*i.e.*, sand, clay, voids).

Levee regions identified in the aerial geophysical surveys as questionable or inappropriate for flood control purposes would be re-surveyed using surface geophysics methods. Surface geophysical surveys would generate detailed resistivity/conductivity data to more accurately quantify integrity of the levee. Results of the surface geophysical survey would determine the sites that require geotechnical investigations (*i.e.*, analysis of soil borings). Combined results of the geophysical and geotechnical drilling program would conclude where levees must be completely replaced (using new material) or rehabilitated (replace some material and re-compact). The USIBWC plans to complete the geotechnical investigations during Fiscal Year 2004.

3.6.2 Recreation Enhancement Within the ROW

Due to the relatively restricted access to the Rio Grande, recreational opportunities have been available primarily at Percha and Leasburg State Parks, and city parks such as La Llorona Park in Las Cruces, New Mexico. The USIBWC is participating in various initiatives, proposed or currently underway, to increase recreational opportunities and expand public access to the RGCP natural resources.

Rio Grande Riparian Ecological Corridor Project

In June 2000, the City of Las Cruces received an award from the USEPA Sustainable Development Challenge Grant program to create the Rio Grande Corridor Project (City of Las Cruces 2003). The Project encompasses a distance of 11 linear miles, from the Shalem Colony Bridge to the Mesilla Dam, and is envisioned for both the western and eastern banks of the southern Rio Grande. The projects would involve cooperative agreements from the USIBWC and a number of other agencies which operate and maintain projects along the Rio Grande. Some of the projects include sites within the floodway identified in the AFR as potential areas for environmental improvements (Parsons 2001a).

Rio Grande River Park

The Rio Grande River Park is a project proposed for construction in phases as part of redevelopment of downtown El Paso, Texas. The National Park Service Rivers and Trails Program provided planning assistance, and the USIBWC provides access to a portion of the trail corridor. It would include an approximately 80-acre linear park and a trail for hiking, running, biking, and roller blading along the Rio Grande adjacent to downtown El Paso. The park would extend from the eastern edge of the Chihuahuita neighborhood adjacent to the international border crossing area at Santa Fe Street, to the Hart's Mill and Old Fort Bliss approximately 1.5 miles upstream. The river park was supported by the 1998 designation of the Texas portion of the Rio Grande as an American Heritage River, a White House initiative to help communities alongside their waterfronts preserve the rivers' histories and support natural resources and environmental protection.

El Paso County River Park

The USIBWC has an existing lease with the County of El Paso for a river park and trail extending from Country Club Bridge to Vinton Bridge on the west floodway. The county is currently developing the approximately 150-acre area. The county plans to extend the park at a latter date from Vinton Bridge to the Texas / New Mexico state line. The extension is planned to be about 75 acres on the east floodway. The county park plans include trails to accommodate pedestrians, bike and horse activities, park benches, green areas, historic interest signs, and small bridges to cross the drains.

City Park of Sunland Park, New Mexico

The 57-acre Sunland Park, New Mexico river park is located upstream from Anapra Bridge within the flood plain on the east side of the river. It includes picnic tables, grills, portable restrooms, and a playground for day use.

The cities of El Paso and Sunland Park are proposing to eventually connect their respective river parks to the existing El Paso County river park. Master plans indicate connecting all existing and proposed city parks adjacent to the Rio Grande along the Canalization and Rectification projects.

3.7 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

During the scoping process, partial decommissioning of the RGCP was suggested as an alternative to be considered in the EIS. Decommissioning entails discontinuing most current maintenance activities of the flood control system and water delivery channel to allow changes in stream configuration. This alternative was reviewed in the AFR and excluded from the EIS analysis because

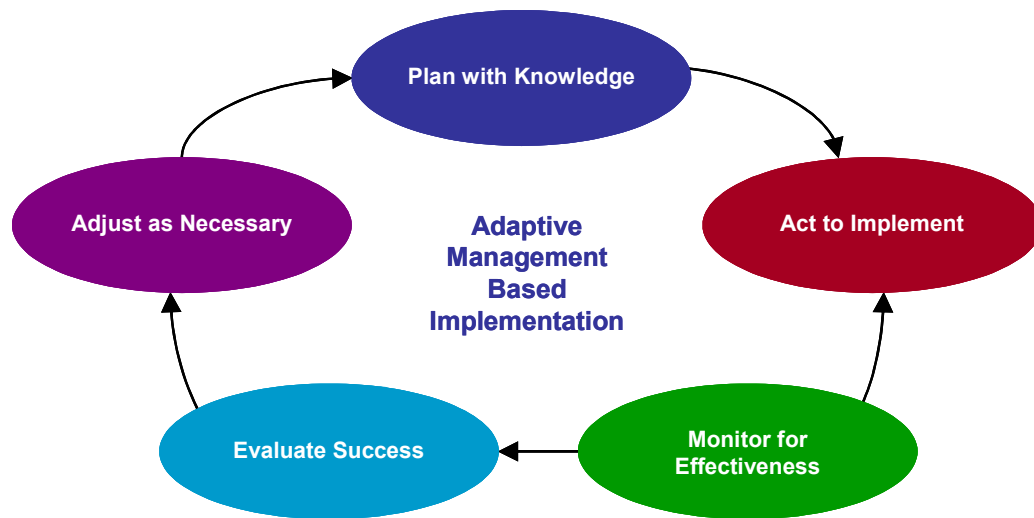
- It renders the RGCP non-functional both in the short and long-term, and fails to meet the Congressionally mandated commitment to U.S.-Mexico water delivery treaties.
- Stream configuration along the RGCP is not controlled by the levee system, but by upstream regulation of the flow regime that pre-dates RGCP construction by several decades. Flow regime, stream configuration, and the potential role of the levee system in RGCP restoration are discussed in Subsections 4.1, 4.2, and 4.3, respectively.

3.8 IMPLEMENTATION STRATEGY

3.8.1 Program Management

The use of adaptive management is anticipated in implementing river management alternatives selected for the RGCP. Adaptive management is a science-based decision process that will lead to better management through a systematic process of prediction, application, monitoring, feedback, and improvement (Figure 3-3).

Figure 3-3 Adaptive Management Strategy (USBR 2000)



The adaptive management scheme lays out specific, measurable goals to be achieved but allows for continuing evaluation and adjustment to cope with unexpected results or changing conditions. The adaptive management approach also allows for development of new management techniques through experimentation (USBR 2000). An adaptive management strategy has been adopted because of the following factors:

- The large scale and resources needed for ecosystem restoration and habitat improvements;
- Implementation of environmental measures would occur over an extended period of time; and
- Uncertainties in projecting hydrologic, geomorphic, and ecosystem responses, and those associated with future conditions of weather, streamflow, and channel morphology.

It is envisioned that adaptive management would be implemented through coordination with the Paso del Norte Watershed Council established by the New Mexico-Texas Water Commission. The Council, established to oversee implementation of enhancements for the El Paso-Las Cruces Regional Sustainable Water Project, would serve in an advisory capacity regarding selection, planning, and implementation of environmental measures. The Paso del Norte Watershed Council would also recommend policies for cooperation and sharing information concerning planning and management activities of other projects potentially affecting the operation and management of the RGCP. Membership to the Council is open to all municipalities, water agencies, researchers, educators, businesses, volunteer organizations, and concerned citizens.

It is anticipated that guidance for future project needs and actions would be provided by an External Advisory Committee to obtain impartial, scientifically informed evaluations, and

that a long-term monitoring and evaluation program would be established. The program would document changes in river flow regime, groundwater depth, vegetation communities, and other predetermined aspects of the biological diversity of designated restoration and control sites.

3.8.2 Water Acquisition

While a number of measures under consideration as part of the RGCP management alternatives would result in water consumption, the USIBWC does not own water rights in the RGCP. All river water and agricultural return flows are fully allocated for irrigation of about 178,000 acres of land in New Mexico and Texas as part of the USBR's Rio Grande Project in operation since 1905 (www.usbr.gov/dataweb/html/riogrande.html). Because the USIBWC does not have any water rights within the RGCP, water rights acquisition in cooperation with EBID and EPCWID#1 becomes a critical element in the viability and long-term sustainability of several environmental measures. Water rights acquisition for implementation of reformulated alternatives would rely primarily on two strategies, supporting water conservation programs within the irrigation districts, and water banking. These strategies, summarized below, are described in greater detail as part of the water issues (Subsection 4.1.4)

Support of water conservation programs by financing on-farm water conservation programs would not only be consistent with stated interests of the irrigation districts (EBID 1998, EPCWID#1 2000), but would also facilitate seeking funds from high-priority state and federal programs. Such conservation programs would focus on financing more efficient irrigation systems whose adoption would represent a substantial investment for individual farmers. Providing the improved systems as a compensation for water rights attached to any saved water would provide an economic incentive not yet available to foster such on-farm water conservation programs.

Water banking is a water management strategy that speeds up the temporary transfer of water from those willing to lease it to those willing to pay to use it. Farmers and other water rights holders can deposit some or all of their allotted water into a "water bank" where users pay the going market rate to borrow it for a limited period of time. The water banking concept has already been used by the New Mexico State Engineer's Office for limited application in the Lower Pecos River Basin (NMOSE 2003).

Both strategies, supporting water conservation programs and water banking, would allow gradual implementation of measures under consideration over a 20-year horizon. The implementation timetable, described in Subsection 3.9, considers an initial development period during which financial/cooperative agreements can be reached, and pilot-scale projects tested in terms of viability, environmental benefit, and potential water use prior to the implementation of projects on a larger scale.

3.8.3 Cooperation Agreements

Cooperation agreements were identified as a viable strategy for increased sediment control at a watershed level, and for acquisition and management of conservation easements.

Watershed Management for Increased Sediment Control

While an increased erosion control program to be implemented within the ROW is proposed as part of the RGCP river management alternatives, the need for additional sediment load reduction might be identified in the future once that program is implemented. In the near future, the need for sediment removal along the RGCP channel has been identified only for the Seldon Canyon RMU.

If additional sediment control were needed beyond proposed improvements, erosion control programs at a watershed level would be evaluated for individual tributary basins. Those evaluations, as well as their implementation, would be conducted through cooperative agreements with agencies such as NRCS and Bureau of Land Management (BLM) that have the expertise, extensive land control, and resources for implementation of large-scale soil protection programs. Emphasis for those erosion control programs will be placed on tributary basins identified in the 1996 USACE study as major sources of the RGCP sediment load where erosion control could be an alternative to construction of sediment control dams. Those basins are located in the Rincon Valley, and include Rincon, Trujillo, Bignell, Placitas, Sibley and Montoya Arroyos, as well as Tierra Blanca Creek. Sediment loads to the RGCP are discussed in Subsection 4.2.4.

Easement Acquisition and Management

Flood easements as well conservation easements could be incorporated in the future as part of the RGCP management alternatives. Flood easements, while their acquisition is not anticipated in the short-term, could be acquired in the future by the USIBWC as part of a revised flood control strategy. Easements would add flood protection beyond that already provided by a levee system that has been in place for over 60 years. Under these conditions flood easements would cover areas without recurrent flooding and in relatively elevated terrain with little potential for riparian corridor development.

Conservation easements outside the ROW would provide connectivity with undeveloped areas and provide a buffer to riparian vegetation. These objectives do not fall within the Congress-mandated mission for the RGCP and, thus, they would not be operated under USIBWC jurisdiction. Easement acquisition and management would be done through cooperation agreements with other agencies with natural resources management capabilities and funding, and environmental organizations placing high priority on habitat conservation by land acquisition. Cooperative agreements could include USFWS, USACE, NRCS, National Park Service, New Mexico Game and Fish (NMGF), Texas Parks and Wildlife Department (TPWD), county/local conservation/recreational agencies, and organizations such as the Nature Conservancy.

Implementation of such initiatives by other agencies and organizations would be independent of the management strategy and timetable selected by the USIBWC for the RGCP.

3.9 IMPLEMENTATION TIMETABLE

Establishing a riparian corridor and aquatic habitat diversification are envisioned as long-term processes that will progress as water is secured and the effectiveness of projects is documented. Direct intervention measures such as pole planting, micro-irrigation, and induced overbank flooding for seedling germination by bank re-shaping and/or controlled water releases, will be initially required to induce development of the riparian corridor over selected areas in the upper reaches of the RGCP. Dredging will be initially required for reopening meanders and for embayments in arroyos, and after a number of years to maintain their functionality.

Once established, riparian vegetation could be expanded and maintained in the long run through continued use of agricultural practices such as flood irrigation or micro-irrigation and, in some areas, controlled discharges from Caballo Dam during high runoff years. Given the physical limitations for potential releases and available floodable land, overbank flooding appears to be practical mostly in the Rincon Valley. In this area controlled discharges would be gradually increased, as dictated by the success of previous releases, until a selected maximum target for release is achieved. In all areas where expansion of the riparian corridor is anticipated, routine tracking of groundwater depth will be required to ensure adequate conditions for establishment of riparian vegetation (typically less than 10 feet for cottonwoods and willows).

Monitoring of measures is applied to all alternatives. Monitoring includes observing the area and/or collecting data for a period of time after conducting measures to determine if it is achieving its intended functions. Regulatory agencies are generally moving in the direction of requiring monitoring. For example, the USACE requires at least 3 years of monitoring of mitigation wetlands, including submittal of written progress reports.

A 20-year timeline was adopted for project implementation. The timeline was divided into three phases. During the 5-year Phase 1, implementation plans would be developed and funded, agreements would be reached for interagency cooperation and water use, and selected projects would be tested at a pilot scale. Project performance would be monitored to determine their success, water use, and need for modification, and to conduct an environmental benefit versus investment analysis. Priority projects, as determined by the potential environmental benefit, would be implemented during a 5-year, Phase 2. Remaining projects would be implemented in the following 10 years, in Phase 3. Site prioritization would be conducted according to an adaptive management approach previously discussed. Following Phase 3, environmental measures would be maintained in the long run and, to the extent possible, expanded to sustain the riparian corridor and ensure functionality of aquatic habitat diversification projects. Timetables for linear and point projects, presented in Tables 3-11 and 3-12, respectively, are described below.

Linear Projects

Grazing Modifications. All projects would be completed during Phase 1 and would include development of guidelines, compliance policies, projects implementation and monitoring programs. Subsequent phases would involve continued implementation,

monitoring and revision of the guidelines as necessary. These projects are the least complex to implement because the measure is limited to change in practices within ROW, and involves no water use. The projects would be conducted throughout most of the RGCP.

Grassland Management. Phase 1 includes a single pilot project in the upper Rincon valley. The remaining four projects would be implemented in Phase 2 followed by monitoring and modifications to the guidelines as necessary. The projects would be conducted primarily in the Rincon and Mesilla Valleys.

Peak Flows. Phase 1 concentrates on water acquisition and agreements for water use by controlled releases from Caballo Dam. Peak flows would be implemented during Phase 2 and 3 coupled with monitoring and modifications as necessary. The projects would be conducted in the Rincon Valley.

Conservation Easements. Phase 1 would include development easement agreements and target remnant bosques in the Lower Rincon and Seldon Canyon projects. Phase 1 easements coincide with areas identified for induced overbank flows by controlled water releases. Phase 2 would include easement agreements and project implementation in the Mesilla Valley and El Paso. Target areas are located in the Rincon and Mesilla Valleys.

Table 3-11 Implementation Timetable for Linear Projects

Measure		Phase 1 (Years 1-5)	Phase 2 (Years 6-10)	Phase 3 (Years 11-20)	Alternative*
Grazing modifications	Actions	Guidelines, Implementation	Guidelines revision, monitoring		MFCI, IULM, TRR
	Projects	UR-1, LR-1, UM-1, LC-1, LM-1, EP-1			
Grasslands management	Actions	Guidelines, pilot testing and monitoring	Implementation, monitoring	Monitoring	IULM, TRR
	Projects	UR-2	LR-2, UM-2, LC-2, LM-2		
Peak flows	Actions	Agreements, water acquisition	Implementation, monitoring	Monitoring	TRR
	Projects		UR-3, LR-3		
Conservation easements	Actions	Agreements; target remnant bosques	Implementation	Secure additional easements	TRR
	Projects	LR-4, SC-4	LM-4, EP-4		

* MFCI, Modified O&M and Flood Control Improvement Alternative; IULM, Integrated USIBWC Land Management Alternative; TRR, Targeted River Restoration Alternative.

Point Projects

Planting and Bosque Enhancement. Phase 1 includes pilot projects in the Rincon Valley and south of Las Cruces. Pilot projects include 2 small sites (9.1 acres) and a larger site (71 acres) coinciding with a planned restoration projects, the Picacho Wetlands Pilot Project (SWEC 2002). Implementation throughout the RGCP would begin in Phase 2 and 3 after site

specific monitoring and potential modifications are made to the measure. Phase 2 emphasizes the Rincon Valley and Phase 3 completes the Rincon Valley and the remaining RGCP projects.

Stream Bank Shavedowns. Phase 1 includes a pilot projects in the Rincon Valley of a single 3.4-acre project. Implementation throughout the Rincon Valley would begin in Phase 2 and 3 after site specific monitoring and potential modifications are made to the measure. Phase 2 includes five projects north of Yeso Arroyo and Phase 3 the remaining three projects. Selection of projects was based on a representative example of the measure to test and provide several years of monitoring before larger scale implementation. The projects would be conducted in the Rincon Valley.

Reopening of Meanders. Phase 1 includes a pilot project in the Rincon Valley of a single 6.6-acre project. After site specific monitoring and potential modifications are made to the measure, the remaining projects would be conducted. Phase 2 includes two projects (22.4 acres) and Phase 3 includes three projects including the largest restoration project (84.6 acres at mile 54). The largest and potentially more water consumptive projects are planed for Phase 2 and 3 after water acquisition agreements can be put in place. Pilot testing would provide several years of monitoring before larger scale projects are implemented.

Modified Dredging of Arroyos. Phase 1 includes a single pilot project in the Rincon Valley. The project coincides with the location other measures involving construction/earth moving. Implementation throughout the RGCP would begin in Phase 2 and 3 after site specific monitoring, water use agreements and potential modifications are made to the measure. As with Phase 1, these projects would coincide with other measures involving construction/earth moving. Selection of projects would be based on a representative test implementation and would provide several years of monitoring before larger scale implementation. All projects would be conducted in the Rincon Valley.

Table 3-12 Implementation Timetable for Point Projects

Alternative / Measure	Measure ID	Projects by River Mile		
		Phase 1 Pilot Testing (Years 1-5)	Phase 2 (Years 6-10)	Phase 3 (Years 11-20)
Integrated USIBWC Land Management Alternative				
Planting and bosque enhancement	A	105, 104, 41	102, 101, 99, 98, 95,	83, 76, 54, 48, 46, 42
Stream bank shavedowns	B	104	103, 102, 101, 98, 94	92, 83, 76
Targeted River Restoration Alternative				
Planting and bosque enhancement	A	105, 104, 41	101, 99, 97, 48, 46, 42	94, 83, 76
Reopening meanders	C	105	102, 54	97, 92
Modified arroyo dredging	D	104	103, 102, 101, 99, 98, 95, 94	85, 83, 78, 76